ANNALS

OF

The Entomological Society of America

VOLUME XIV, 1921

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PUBLISHED QUARTERLY BY THE SOCIETY
COLUMBUS, OHIO

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DATES OF ISSUE FOR 1921.

March number issued April 23, 1921.
June number issued August 11, 1921.
September number issued September 13, 1921.
December number issued December 31, 1921.

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THE IMPUDICA GROUP OF THE DIPTEROUS GENUS TIPULA LINNAEUS.

By W. G. Dietz, M. D.

A sharply defined, natural group of the genus Tipula Linnaeus, characterized as follows: Hypopygium of the male—the genital chamber widely open above, (Pl. I, Figs. 1, 2, 3, 4, 5, 6, 6a). The ninth tergite relatively short, the ninth sternite much prolonged beyond the former. The ninth tergite deeply incised in the middle (except madina), the sides emarginate, the lateral portion more or less distinctly incurved beneath, (Pl. I, Fig. 6c). The incurved margin generally ends in a sharp spine, (Pl. I, Fig. 6c), visible in some species (impudica, dimidiata. Pl. I, Figs. 6b, 8) from above. From the lateral inflexed margin extends a thin shelf or lamina, which bears in the middle a process, compressed and sharply pointed, (except *pyramis pellucida*, where it is broader and obtuse), the upper margin of which fits into the median incision of the tergite, (Pl. I, Figs. 6b, 6c, 8, 9). This process I designate as the subtergal process. Ninth sternite ample, more or less deeply emarginate. Pleurites ample, subtruncate or more or less cone-shaped. Pleural suture present, abbreviated (Pl. I, Fig. 1a). The outer apical appendages are small and inconspicuous, narrowly lanceolate, curved cephalad, the apices abut into or lie beneath the lateral emargination of the ninth tergite, Pl. I, Figs. 1, 2, 3, 4, 5, 6, 6a). The inner apical appendages more conspicuous, the posterior portion laminate and subcautinous with the lower apical appendages; the anterior portion is elevated and consists of two more or less distinct, narrow perpendicular blades (Pl. I, Fig. 1a), which are strongly chitinized and the anterior end of the inner blade overlaps the

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The eighth sternite is narrowed posteriorly, subtruncate, or emarginate apically and bears a brush of stiff hairs. In two species (*pyramis*, *pellucida*, Pl. I, Figs. 7 and 7a) the apical margin bears a median process, from its upper surface, near the base, projects a long, slender, curved appendage (Pl. I, Fig. 7).

Ovipositor elongated; valves slender, the upper pair slightly curved upwards.

The following characters are common to all the species here enumerated and will not be repeated in the description of new species. Rostrum of moderate length and thickness; nasus short, obtuse (except *mitrata*). Palpi robust, the last joint at most as long as the three preceding joints together. Frontal callosity small. Antennae of moderate length, flagellar joints approximately unicolorous, fuscous, except the basal joint, which is more or less concolorous with the scapal joints; the basal enlargement, bearing the usual whirl of setae, is usually more blackish than the rest of the segment, the setae scarcely as long as the respective segment. Thoracic dorsum with four darker lines or stripes, generally narrow (broad, *pyramis*, *pellucida*), the inner pair of these lines apparently limit the normal median vitta, are wider and curved outwardly in front, becoming attenuated and approximating each other posteriorly; the lateral stripes are scarcely more than one half the length of the thorax, the anterior end being at same distance from the pseudosutural foveae, and are margined with a paler line (except *pyramis*, *pellucida*); the outer edge of the inner lines bears a row of generally very short hairs. Wings approximately unicolorous, antestigmal spot distinct, extending at least into cell 1st M^2; except *dimidiata*, stem of cell M^1 scarcely more than one-third the length of the cell. The setigerous punctures (Trans. Am. Ent. Soc., XLIV, p. 107), are especially marked on veins R, Cu, Cu^1 and A^2. Halters pale, knob dark fuscous.

The species are of medium to fairly large size, except *dimidiata*, which is a small fly. As far as known to me, they are all inhabitants of the Pacific slope.

KEY TO THE SPECIES.

1. Eighth sternite of male with a median process; subtergal process short, obtuse and not compressed laterally.................................... 2
   Eighth sternite without such a process. The subtergal process long, compressed, pointed.. 3
2. Process of eighth sternite elongate, pointed................*pyramis* Doane
   The process shorter, rounded..............................*pellucida* Doane
3. Lower apical appendages of hypopygium long, lanceolate, conspicuously extending beyond the ninth sternite.................................. 4
   This appendage is broader, ploughshare-shaped; not conspicuously prolonged... 5
4. Canthi of the median incision of the ninth tergite very acute (Pl. I, Fig. 1), *diversa* spec. n.
   Canthi obtuse, (Pl. I, Fig. 2)...........................*lyrifera* spec. n.
5. The ninth tergite produced in the middle, (Pl. I, Fig. 3)........*madina* sp. n.
   The ninth tergite deeply and distinctly incised in the middle............ 6
6. Pleurites subtruncate, or emarginate above............................ 7
   Pleurites obtusely pointed above..........................*mitrata* spec. n.
7. Incision of ninth tergite broadly U-shaped.............................. 8
   Incision narrow, sub-parallel, or V-shaped............................. 9
8. Canthi of the incision acutely pointed, (Pl. I, Fig. 9).........*sinistra* spec. n.
   Canthi obtuse, subangulate, (Pl. I, Fig. 4)...................*spernata* spec. n.
9. Incision deep, narrow, sub-parallel; canthi prominent, acute, (Pl. I, Fig. 5)..*spaldingi* spec. n.
   Incision V-shaped, canthi prominent....................................10
10. Canthi obliquely truncate, slightly emarginate, (Pl. I, Fig. 6b), *impudica* Doane
    Canthi very acute, (Pl. I, Fig. 8)........................*dimidiata* spec. n.

AUXILIARY KEY TO THE SPECIES.

1. Costal wing-margin fuscous...............................*pellucida* Doane
   Not as in the alternative... 2
2. Cell C of Wing concolorous.. 3
   Cell C and S. c. yellowish*... 8
3. Cu. and its branches margined with fuscous............................ 4
   Not as in the alternative... 5
4. Thorax grayish; the antestigmal spot extends into cell Cu^1..*diversa* spec. n.
   Thorax dark yellow; the antestigmal spot does not extend into cell Cu^1, *spermata* spec. n.
5. Wings pellucid.......................................*spaldingi* spec. n.
   Wings grayish... 6
6. Antestigmal spot small, does not extend beyond R. s.; small form, *dimidiata* sp. n.
   This spot attains cell 1st M^2...................................... 7
7. The dorsal abdominal stripe extends uninterruptedly upon the sixth tergite...*madina* spec. n.
   Not as in the alternative................................*mitrata* spec. n.

---

*Generally Cell C is paler yellow than Cell S. c.; very pale in some species.

8. Cu. and its branches seamed with fuscous................*sinistra* spec. n.
Not as in the alternative.. 9
9. Thorax and wings more grayish...........................*impudica* Doane
Thorax yellowish; wings sub-pellucid, yellowish at the base..............10
10. Thoracic stripes broader...................................*pyramis* Doane
Thoracic stripes narrow...................................*lyrifera* spec. n.

Tipula diversa spec. n.

Large, yellowish-gray. Wings gray, a fuscous dot at origin of R. s. and at end of S. c. Veins Cu and Cu^2 lightly seamed with fuscous. Ninth tergite of male with a narrow and moderately deep incision, its canthi acute. Lower apical appendages long, narrowly lanceolate, divergent and conspicuously extending beyond the ninth sternite.

Male.—Length 19.5 mm.; wing 19 mm.

Head: Rostrum yellow, beset with rather long, black hairs. Three basal joints of palpi sordid yellow, terminal joint dark fuscous. Flagellar joints of the antennæ emarginate above the basal enlargement, joints ten and eleven much more attenuate, the last thirteened joint, very short; pubescens very fine, white. Face yellowish-white, front and occiput yellowish gray with a distinct median, dark line, extending from the tuberosity to the posterior margin; orbicular margin whitish.

Thorax livid. Pronotal scutum margined with white anteriorly, a dark, median line and a dark spot externally. Pronotal scutellum whitish above, darker laterally. Lines of prescutum chocolate-brown, narrow; the inner pair strongly attenuated in their middle third; the median space with an ill-defined, irregular, darker median stripe; the space, exterior to the inner lines and exterior to the pale line surrounding the outer dark lines, is conspicuously studded with setigerous punctures, bearing blackish hairs. Scutum with a smaller, antera-exterior, and an elongate, inner, brown spot each side. Scutel and postnotum with median, darker line, the postnotum with a lateral, darker spot. Pleura yellowish-gray with whitish pruinosity. Wings grayish, more so in the apical portion. Cells C. and S. c. concolorous, scarcely a shade darker than the general color. A fuscous spot at the beginning of R. s. and at the end of S. c. Antestigmal spot well marked, interrupted immediately behind R. s., extends through outer ends of cells R. and M., basal half of cell 1st M^2, into bases of cells M^4 and Cu^1. Veins Cu, Cu^1 and Cu^2 lightly seamed with fuscous. Cells R. and M. more grayish along the center. Stem of cell M^1 scarcely one-sixth the length of the cell. Legs long and slender, yellowish, with a coarse, short, blackish pubescence, femora and tibiæ infuscate at the apex, the tibiæ longer than the metatarsi; tarsi infuscate.

Abdomen yellowish-brown, lighter basally, segments three to six narrowly edged with white posteriorly, a dark-brown dorsal and ventral stripe, lateral stripes ill-defined; the whole abdomen hirsute with an ill-defined, whitish sheen. Eight sternite with a brush of long, yellow hair. Hypopygium (Pl. I, Fig. 1), yellowish-brown, darker posteriorly; ninth tergite with a broad, deep, basal impression, and narrow, moderately deep, median incision, its canthi acute, exteriorly to the latter, the margin is deeply emarginate, the inflexed portion ends in a spine; the subtergal process is long, laterally compressed and very acute. Ninth sternite with deep, U-shaped emargination. Pleurites ample, subtruncate, emarginate, each end of the emargination ends in a claw-shaped, inward bent hook. The lower apical appendages are long, narrowly lanceolate, somewhat twisted and extend considerably beyond the ninth sternite.

Female.—Length 21 mm.; wing 16.5 mm. The dorsal abdominal stripe entire on tergite one, indicated by a median dash anteriorly on segments two to six; lateral margin of tergites conspicuously white and a large, lateral, fuscous dash on each segment; tergites two to seven with a transverse line each side, anteriorly; venter paler; hirsutity in conspicuous.

Holotype—♂. Vineyard, Utah, June, 1912, (T. Spalding).

Allotype—♀. Silver City, New Mexico, May 24, 1913.

Paratypes—1 ♂. Platt Canyon, Colorado, June 27, 1915. 2 ♂ ♂, Clear Creek, Colorado, June 23, 1914 (Oslar); 3 ♂ ♂ and 2 ♀ ♀, Silver City, New Mexico, May, 1913.

A very distinct species. Its nearest ally is *T. lyrifera*, which it closely resembles in the lower apical appendages, but from which it is distinguished in its general darker coloration, grayish wings, cell C. concolorous and the fuscous spot at the origin of R. s. and at the end of the S. c. vein.

Tipula lyrifera spec. n.

Yellowish. Wings pale. Ninth tergite of hypopygium with deep, narrow incision, its canthi obtuse; lateral lobes with deep, rounded emargination; lower apical appendages elongate-lanceolate, twisted, conspicuously prolonged beyond the ninth sternite.

Male.—Length 17.5 mm.; wing 17 mm.

Head: Rostrum yellow, frontal prolongation beset with short, black hairs; nasus scarcely indicated. Palpi yellowish, light fuscous outwardly. Face and occiput yellowish with whitish pollinosity and darker median line.

Thorax light, grayish-yellow. Pronotal scutum infuscate in the middle; scutel pale yellow. Prascutal lines light brown, the inner pair almost obsolete posteriorly; sides of præscutum light brown. Scutum concolorous, an elongate light brown patch along the median line, another, irregular, curved line externally. Scutel and postnotum slightly darker, the former with an obscure, the latter with a distinct, median fuscous line.

Pleura sordid yellowish, with grayish-white bloom. Legs slender, yellowish; hairy vestiture dense, short, blackish. Femora and tibiæ lightly infuscate at the apex, tibiæ conspicuously longer than the metatarsi; tarsi yellowish-fuscous.

Wings pale with a faint, yellowish-gray tint, more grayish towards the apex; costal cells pale yellow; stigma yellowish fuscous. Ante- and post stigmal spots less conspicuous than in *divergens*, extending through basal half of cell 1st M^2 into cells M^4 and Cu^1; veins brown, not seamed with fuscous; stem of Cell M^1 about one-third the length of the cell.

Abdomen yellowish with ill-defined, pale fuscous dorsal line, interrupted on the segmental incisions; posterior margin of segments one to four pale; hairy vestiture short, sparse, blackish; venter pale. The eight sternite yellowish-fuscous, with a dense brush of stiff, yellow bristles. Hypopygium (Pl. I, Fig. 2) yellowish-brown, appendages yellowish-white. The ninth tergite with deep, narrow, median incision and a longitudinal furrow; canthi somewhat prominent, obtuse—seen from above—ending in an acute tooth directed ventrad; the subtergal process slender, acute; lateral lobes of the somite deeply emarginate, the inflexed portion without perceivable spine. The ninth sternite with a deep, U-shaped emargination, the lateral margin of which bears a pale-yellow, membranous appendage. Pleurites slightly emarginate above, each end of the emargination sharply acuminate, the anterior sharp point incurved; the evoluted portion of the inner lamina of the inner, apical appendage very small and inconspicuous; the lower apical appendage long, lanceolate, twisted, deeply sinuate near its base within and conspicuously extended beyond the ninth sternite; its inner face conspicuously bearded with yellow hair.

Holotype ♂. Vineyard, Utah, June 6, 1912 (T. Spalding).

Closely allied to and congeneric with *divergens*, from which it differs in its somewhat smaller size, paler color of body and wings and absence of fuscous spots at origin of R. s. and end of S. c. vein.

Tipula madina spec. n.

Medium size. Cell C. concolorous. The ninth tergite of the hypopygium produced in the middle with a small central emargination; evoluted portion of the inner lamina of the inner apical appendage large, leaf-like; lower apical appendage not protruding beyond the ninth sternite.

Male.—Length 13.5 mm.; wing 14.7 mm.

Head: Rostrum yellow, shining, nasus distinct, obtuse; hairy vestiture blackish, inconspicuous; palpi pale fuscous. Scapal joints of antennæ yellow. Face, front and occiput, pale yellow with whitish bloom, the occiput with impressed, darker line.

Thorax livid. Pronotal scutum yellowish; scutel pale yellowish, sides fuscous. Lines of prascutum light brown, narrow, distinct; interspaces with numerous piliferous punctures, hairs very short, blackish. Scutum with a smaller, rounded, antero-exterior spot and an elongated, larger inner patch each side, light brown. Scutel and postnotum with median, darker line, the postnotum darker on the sides. Pleura gray with whitish pollinosity, the pteropleura and pleuro-dorsal membrane sordid yellow. Legs slender, yellowish, pilosity very short, brownish; femora slightly, tibiæ not, infuscate at the apex, the latter distinctly longer than the metatarsi; tarsi infuscate. Wings pale-gray, Cell S. c. and base yellowish, Cell C. concolorous. Stigma pale fuscous. Veins C., S. c. and R. yellowish, other veins brown, not seamed with fuscous; the antestigmal spot inconspicuous, ill-defined, extends interruptedly thru base of cell 1st M^2, into base of cell M^4; post-stigmal spot distinct.

Abdomen yellow with light brown dorsal vitta, extending uninterruptedly from tergite one to the base of tergite six; a lateral, conspicuous dash on tergites one to eight; lateral margin pale, grayish-yellow. Venter somewhat darker along the median line, more so caudally. The eight sternite broadly truncate with a brush of moderately long bristles; central bristles decussating. Hypopygium (Pl. I, Fig. 3) yellowish brown; the ninth tergite produced mesially and slightly emarginate apically, broadly and deeply grooved, lateral lobes with deep, rounded emargination; the subtergal process acute, almost entirely concealed by the large, evoluted portion of the inner apical appendage. The ninth sternite with a broad, U-shaped emargination, the margin pale yellow with a narrow, pale, membranous appendage. Pleurites subtruncate, angles of the truncature acuminate; the inner apical appendages conspicuous, bent dorsad apically, the evoluted portion large, leaf-like, almost completely concealing the subtergal process; the lower apical appendages broad, convoluted, yellow-haired within, with a patch of dark brown hairs; caudal portion subdorsad, apex obtusely rounded. Penis guard large, conspicuous.

Holotype—♂. Prova, Utah, June 24, 1912 (T. Spalding).
Paratype—1 ♂.

The formation of the ninth tergite distinguishes this species from the other members of the group.

Tipula spaldingi spec. n.

Moderately large; general coloration yellowish. The ninth tergite deeply incised and narrowly and deeply channeled its whole length; canthi produced, acute. The lower apical appendages obtusely rounded at the apex.

Male.—Length 17 mm.; wing, 16 mm.

Head: Rostrum yellow, some lustre; frontal prolongation sparsely hairy. Palpi brownish-yellow, darker outwardly. Antennæ rather slender and somewhat elongate; scapal and first flagellar joints, pale yellow, following joints subcylindrical, light brown, outer joints dark, pubescens white. Face, front and occiput yellowish with a white bloom, a dark fronto-occipital line.

Thorax yellowish-gray, mesonotum more livid. Pronotal scutel yellowish above. Prascutal lines light brown, narrow and nearly straight, hairs of the interspaces very fine and short; markings of scutum ill-defined, a smaller, rounded, antero-exterior spot and an elongate blotch along the median line; scutel and postnotum grayish-pollinose with a faint, median line. Pleura yellowish-gray, pollinose; pleuro-dorsal membrane yellowish. Legs slender, yellow; pilosity coarse, short, blackish and somewhat appressed; femora and tibiæ slightly infuscate before the apex, the tibiæ longer than the metatarsi; tarsi yellowish-brown. Wings subhyaline with a yellowish tinge, cell C. concolorous; costal veins and vein R. yellowish, the other veins brown, delicate; stigma light brown; antestigmal spot distinct, extends thru outer end of cell R. extreme point of Cell M, basal portion of cell 1st M^2 into base of cell M^4 and slightly into base of cell Cu^1; post-stigmal spot ill-defined; a whitish streak, not very distinct, in cell A^1.

Abdomen yellow, dark brown dorsal and lateral stripes (very variable in different specimens), lateral margin of tergites yellowish-gray; venter somewhat darker, especially posteriorly. Eight sternite subtruncate with a dense brush of coarse, brownish bristles, longer than the somite. Hypopygium brownish-yellow; ninth tergite deeply grooved in the middle, apical margin deeply and narrowly incised in the middle, canthi prominent, acute, its points slightly depressed, lobes with a deep, rounded emargination, margin of the inflected portion pale yellow; subtergal process compressed, apex bent downward. Ninth sternite with deep, U-shaped emargination, at its lower end, the somite bulges outward in form of an oval appendage; from the upper part of the margin is suspended, a narrow, elongate-triangular, pointed, yellowish, membranous appendage. Pleurites narrowly subtruncate, angles of the truncate cuspidate; evoluted part of the inner apical appendages conspicuous; lower apical appendages relatively short, broad basally, rounded at the tip, a small but deep sinuosity on the inner margin near the base, the inner face of the appendages is coarsely hairy.

Holotype—♂. Eureka, Utah, August 1, 1911 (T. Spalding).

Paratypes—1 ♂. Eureka, Utah, June 30, 1911; 6♂♂, Prova, Utah, June 24, 1912; 2 ♂♂, Stockton, Utah, June 13, 1913, (T. Spalding).

The paratypes from Stockton have the abdomen distinctly darker and the lateral margin of the ninth tergite not paler. The lower appendages in some specimens are conspicuously curved outwardly and visible beyond the ninth sternite. A very distinct species.

Tipula sinistra spec. n.

Moderate size; general appearance yellowish. Cells C. and S. c. yellowish; Cu and its branches broadly seamed with light fuscous. The ninth tergite deeply and broadly emarginate, its canthi acute.

Male.—Length, 15 mm.; wing 17 mm.

Head yellow; rostrum darker, some luster; hairy vestiture sparse, long. Palpi yellowish-fuscous, darker outwardly. Front and vertex with a dense white bloom, fronta-occipital line impressed, fuscous.

Antennæ slender, moderately long; scapal and first flagellar joints yellow, the other flagellar joints uniformly fuscous, subcylindrical, pubescence very fine, white.

Thorax grayish-livid. Pronotal scutel but little paler above. Præscutal stripes light brown, narrow, straight, not curved outwardly in front; the præscutum exterior to the inner lines, grayish pollinose. Markings of scutum ill-defined, a small antero-exterior spot, an elongate spot along the lateral margin and a larger, elongate spot near the median line, light brown; scutel and postnotum brownish-yellow, lateral edge of the latter pale-yellowish. Pleura obscure yellowish with grayish bloom; pleuro-dorsal membrane sordid yellow. Legs brownish-yellow, pilosity coarse, blackish, somewhat appressed; base of femora and coxæ yellow, femora and tibiæ infuscate at the apex, the tibiæ longer than the metatarsi;* tarsi fuscous outwardly. Wings pale gray, subpellucid; cells C and S. c. yellowish; veins C., S. c. and R. yellowish, the other veins brown, delicate, especially beyond the cord; vein Cu, and its branches, very broadly seamed with pale fuscous; stigma pale fuscous; the antestigmal spot very distinct, it extends broadly through the outer part of cell R, occupies nearly three-fourths of cell 1st M^2 and the entire widths of basal two-fifths of cell M^4; cell 1st M^2 pentagonal; stem of cell M^1 one-third the length of the cell.

Abdomen yellow with a faint, darker, dorsal stripe; tergites three to seven with fuscous, lateral line; pilosity sparse, short; venter darker yellow. Eight sternite reddish-yellow, apex truncate with a brush of stiff, grayish-yellow, decussating bristles. Hypopygium reddish-yellow; ninth tergite broadly and very deeply emarginate, the canthi very acute, the part of the somite adjacent to the outer half of the emargination, appears to be more membranous than usual; lobes with moderately deep, rounded emargination; the inflexed portion ends in an acute spine; subtergal process broad, obtusely pointed. Ninth sternite broadly and deeply emarginate, lateral margin with a pale-yellowish, narrow, membranous appendage. Pleurites emarginate above, angles of the emargination acutely acuminate; inner apical appendages strongly bent dorsad in front, evoluted portion conspicuous, large; lower apical appendages rather short, twisted, the apical portion bent outwardly, apex pointed, fuscous within; surface covered with yellow hairs.

Holotype—♂. North-Western Colorado, August 11, 1911, (E. J. Oslar).

A distinct species. Its nearest ally appears to be *impudica* Doane, from which it differs in its more slender antennæ, broadly seamed vein Cu and its branches and the difference in construction of the hypopygium.

Tipula spernata spec. n.

Large; general coloration dark yellow. The ninth tergite of the male abdomen with a deep, U-shaped emargination, the canthi nearly rectangular. Lower apical appendages not prolonged, broad, curved outwardly, the inner angle extended, acute. Vein Cu and its branches seamed with fuscous.

Male.—Length 17 mm.; wing 19 mm.

Head yellow; rostrum beset with rather long, black hairs. Palpi yellowish-fuscous, darker outwardly. Antennæ moderately long, scapal joints yellow, first flagellar joint yellowish-fuscous, remainder fuscous, segments elongate cylindroidal. Vertex dark, sordid yellow with strongly marked impressed, dark fuscous line.

Thorax dark yellow. Anterior margin of the pronotal scutum and a stripe each side grayish-white, within this stripe is narrowly edged with fuscous, while externally to it is a wider, pale fuscous stripe; pronotal scutel pale yellow above, pale fuscous laterally. Prascutal lines not sharply defined, the inner lines sinuous, wider in middle third. Markings of scutum indistinct. Scutel and postnotum grayish-yellow with indistinct median line, the postnotum edged with pale, laterally. Pleura concolorous with a grayish bloom, pleuro-dorsal membrane paler. Legs yellow, pilosity short, blackish, appressed; coxæ paler; femora and tibiæ infuscate at the apex, the latter longer than the metatarsi; tarsi-yellowish fuscous. Wings grayish, darker in apical portion; cell C concolorous, cell S. c. yellow; stigma brown, antestigmal spot conspicuous, extends broadly through the outer end of cell R, basal half of cell 1st M^2 into basal third of cell M^4; post stigmal spot obsolete. Veins brown, Cu and its branches broadly seamed with fuscous; cell 1st M^2 about twice as long as its greatest width, pentagonal.

Abdomen brownish-yellow; a fuscous dorsal stripe on tergites one to four; a lateral stripe interrupted before the posterior margin of the segments, posterior and lateral margins, pale gray. Venter dusky-yellow. Eight sternite slightly emarginate each side of middle, the inner end of the emarginations edged with fuscous, a brush of yellowish-gray bristles, longer than the sternite, pale at the base, the inner bristles decussating. Hypopygium (Pl. I, Fig. 4) yellowish-brown; the ninth tergite short with a deep, U-shaped emargination, its canthi approximately rectangular, lobes feebly emarginate, sides strongly incurved and ending in an acute spine; the subtergal process broad. Viewed laterally, its lower edge nearly straight, obtusely pointed; the evoluted portion of the inner apical appendages inconspicuous; the lower apical appendages broad, curved outwardly, the inner part prolonged and pointed, yellow-haired within. Ninth tergite broadly and deeply emarginate with a narrow, pale, membranous appendage from the edge of the emargination. Pleurites emarginate above, angles of the emargination acutely pointed.

Holotype—♂, South Park, Colorado, June 23, 1916.

Paratype—♂, Clear Creek, Colorado, June 11, 1916, (E. J. Oslar).

Similar to sinistra, but larger, and from which it differs in the prescutal markings and hypopygial construction, especially the tergite and the inner apical appendages; the antestigmal spot is well-nigh identical in both species.

Tipula mitrata spec. n.

Medium size. Head and thorax gray, abdomen yellow. Incision of hypopygeal tergite moderately deep, subparallel. Pleurites obtusely pointed; the lower apical appendages broad; the inner angle produced.

Male.—Length 14 mm.; wing 14 mm.

Head: Rostrum reddish-brown, hairy vestiture blackish and rather long; nasus long and acute. Palpi fuscous. Antennæ of moderate length, scapal and first joint of flagellum yellow, flagellar joints cylindroidal. Face yellowish-white; front and vertex gray with well marked, dark fuscous line.

Thorax gray. Pronotal scutum with median dark line; scutel pale yellow above. Prescutal lines brown, narrow, the inner pair wider in its anterior half, slightly curved outwardly anteriorly; interspaces with numerous setigerous punctures, bearing short, black hairs. Scutum more ashen-gray, a dark spot on the antero-exterior angle and an elongate spot near the median line. Scutel yellowish-gray, shining, with darker, median line. Postnotum dark gray, with median, dark line. Pleural episterna yellowish-gray, epimera dark-gray; pleuro-dorsal membrane sordid yellow, the whole pleura with a grayish-white pollinosity. Legs yellow, hairy vestiture short, dense, blackish and appressed; femora conspicuously infuscate at the apex, tibiæ not infuscate at apex and distinctly longer than the metatarsi; tarsi fuscous. Wings grayish, darker in cells R^2 and R^3; cell C concolorous, cell S. c. and stigma pale fuscous, antestigmal spot distinct, extends broadly through outer end of cell R^1 extreme end of cell M^1 basal half of cell 1st M^2 into base of cell M^4 and slightly into cell Cu^1; post-stigmal spot distinct. Cell 1st M^2 about twice as long as wide, pentagonal; a large subhyaline space in cell M^1 a sub-hyaline streak in cell A^1; veins C, S. c. and R. yellow-brown, other veins brown.

Abdomen yellow; tergites four to six with fuscous, dorsal streak, each tergite with a lateral curved, fuscous dash, abbreviated posteriorly; margin of tergum grayish-white; venter with dusky, median stripe. Eight sternite subtruncate, with a rather narrow brush of yellowish-gray, not very stiff, bristles and a pencil of three or four bristles from the lateral angle bend inward; from the upper surface of the somite same distance from its free margin, arises a soft, membranous, narrow, white process, extending to about two-thirds the length of the brush. Hypopygium brown, shining; ninth tergite broadly and deeply channeled in the middle, incision V-shaped, subparallel, moderately deep, lobes with deep, rounded emargination, sides scarcely inflexed, angles of the median incision prominent, acute; subtergal process long, obtusely pointed. Ninth sternite with V-shaped emargination, the adjoining part of the somite sub-membranous. Pleurites subangulate, obtusely pointed; inner apical appendages small and inconspicuous, the evoluted portion scarcely perceptible; lower apical appendages (Pl. I, Fig. 10), broad and flat, the inner apical angle prolonged and beset with short, yellow hairs.

Holotype—♂. Silver City, New Mexico, May 26, 1913.

In general appearance, this species closely resembles *impudica* but the hypopygeal structure, especially the lower apical appendages, is very different. The peculiar appendage of the eighth sternite must not be confounded with the median process as found in *pellucida* and *pyramis*, where it arises from the edge of the somite and is not membranous.

Tipula dimidiata spec. n.

Small size. Cell C. concolorous; antestigmal spot very faint. Tergite of hypopygium broadly channeled and deeply incised in the middle, the lower apical appendage turned upward apically, fuscous, broadly rounded at the apex.

Male.—Length 10 mm.; wing 11 mm.

Head yellowish-gray. Rostrum dusky-yellow; frontal prolongation with very few hairs; nasus scarcely evident. Palpi light fuscous, darker outwardly. Face whitish; the fronto-occipital line distinct, expanded into a spot on the frontal tubercle.

Thorax yellowish-gray. Pronotal scutum with a white line each side which is continued along the anterior margin, outer part of somite light fuscous; pronotal scutel whitish above, lateral part fuscous. Prescutal lines dark brown, distinct, the inner pair not sharply defined, nearly straight and a trifle wider anteriorly, the median space mouse-gray. Markings of scutum very indistinct. Scutel and postnotum dark gray with faint median line. Pleura and pleuro-dorsal membrane yellowish-gray with a faint, whitish pollinosity. Legs slender, yellowish, pubescence very fine; femora and tibiæ infuscate at the apex, the tibiæ much longer than the metatarsi; outer tarsal joints fuscous. Wings grayish, a trifle darker in apical portion; cell C. concolorous, cell S. c. light fuscous; stigma light fuscous, the ante-stigmal spot very indistinct, extending as a narrow, pale streak through cell 1st M^2 into cell Mi; past stigmal spot obsolete; cell 1st M^2 scarcely twice as long as wide, pentagonal; stem of cell M^1 one-fourth the length of the cell. Veins brown, Cu not seamed with fuscous.

Abdomen yellow, dorsal stripe ill-defined, more distinct on tergite five; lateral fuscous stripe well marked, lateral margin of tergum not paler; venter paler. Eight sternite light brown, apical margin truncate with a narrow brush of yellowish-gray setæ. Hypopygium light brown. Ninth tergite (Pl. I, Fig. 8), broadly channeled and deeply incised, canthi prominent, acute, lobes with deep, rounded emargination; the lateral margin ends in an acute spine; subtergal process narrowly-lanceolate. Ninth sternite deeply and broadly emarginate, margin of the emargination and lower margin of the somite pale yellow. Pleurites subtruncate above; inner apical appendages bent upward anteriorly, the evoluted portion small, but distinct; lower apical appendages irregularly scalloped exteriorly in their basal part, the distal part semi-dorsad, tongue-shaped, fuscous.

Holotype—♂. Silver City, New Mexico, June 1, 1911.

At once distinguished by its small size. Superficially it resembles *impudica* and *mitrata*, from both of which it differs in the faint ante-stigmal spot, aside from structural differences of the hypopygium.

Tip. impudica Doane. Type locality, Wawai, Washington. Numerous specimens in my collection from the following localities in Colorado: Clear Creek, July; Chimney Gulch, Golden, June; Four-Mile Creek, September; Bear Creek, Morrison, July; Cardif, June, July; Mancos, August, (E. J. Oslar).

Tip. pyramis Doane. Type locality, Pryamid Lake, Nevada. Specimens in my collection from the following localities in Utah: Provo, June; Deer Creek, Provo Canon, August; Eureka, June; Stockton, June; Vineyard, July, August, (T. Spalding).

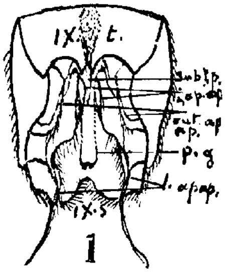
Tip. pellucida Doane. Annals Ent. Soc. of America, Vol. V, p. 61. Tip. clara Doane, syn.

EXPLANATION OF PLATE I.

The following abbreviations attached to the Figures signify as follows:

viii s.—Eighth sternite.
ix t.—Ninth tergite.
ix s.—Ninth sternite.
subt. p.—Suptergal process.
ix p.—Ninth pleurite.
pl. s.—Pleural suture.
I. ap. ap.—Inner apical appendage.
out. ap. ap.—Outer apical appendage.
l. ap. ap.—Lower apical appendage.
p. g.—Penis guard.

1. Tipula diversa. Upper view of hypopygium.
1a. Lateral view of pleurite, showing appendages and pleural suture.
2. Tipula lyrifera. Upper view of hypopygium.
3. Tipula madina. Upper view of hypopygium.
4. Tipula sinistra. Upper view of hypopygium.
5. Tipula spaldingi. Upper view of hypopygium.
6. Tipula impudica. Upper view of hypopygium.
6a. Lateral view of hypopygium.
6b. Ninth tergite from above.
6c. Ninth tergite from below.
7. Tipula pyramis. Lateral view of eighth sternite.
7a. Eighth sternite, seen from below.
8. Tipula dimidiata. Dorsal aspect of ninth tergite.
9. Tipula sinistra. Upper view of ninth tergite.
10. Tipula mitrata. Caudal part of hypopygium showing lower apical appendages, seen from above.



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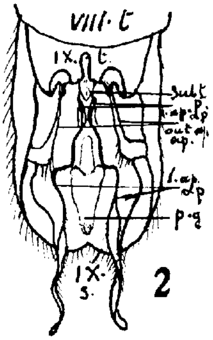

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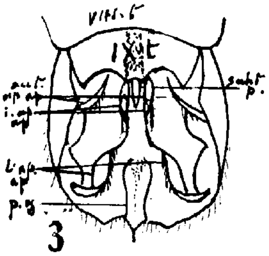

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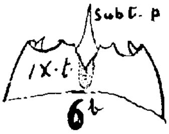

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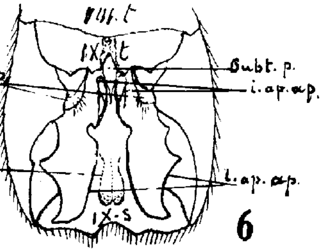

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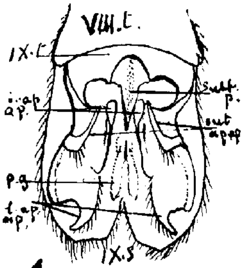

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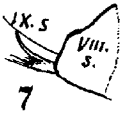

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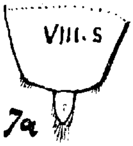

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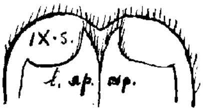

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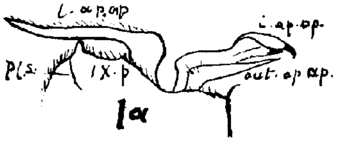

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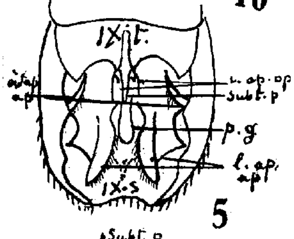

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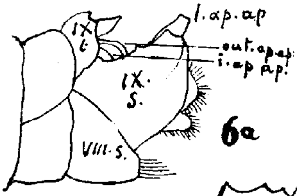

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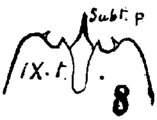

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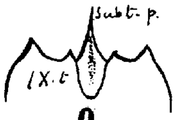

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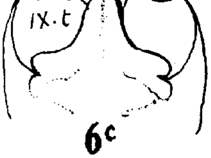

6c

W. G. Dietz

NEW NEARCTIC FOSSORIAL HYMENOPTERA.

By Nathan Banks.
Museum Comp. Zoology, Cambridge, Mass.

The following new species were found in the course of identification work on the Museum collections. A synoptic table of *Pepsis* is given, and also for most of the Eastern species of *Dasymutilla*. In both of these structural characters are utilized that have not previously been considered. The types are all in the Museum of Comparative Zoology.

CRABRONIDÆ.

Entomognathus memorialis sp. nov.

♀. In structure close to *E. lenapeorum*, that is with the frontal groove evanescent and the front below ocelli tumid; clothed with much pale hair, the clypeus silvery, metanotum with sculpture very similar to that species. Black; the scape beneath, pronotum each side and connected down to the tubercles, tegulæ in part, two small spots on the scutellum, front and mid tibiæ on outer sides, hind tarsus on base, and a spot each side on abdominal segments 1 to 4, yellow. It differs from *lenapeorum* in the spotted abdomen, black tarsi and larger size, and the abdomen is broader, especially at base.

Length, 6.2 mm.

From Glencarlyn, Va., July 26th.

Lindenius wenonah sp. nov.

♂. Structure in general similar to *L. errans*, the ocellar depressions, however, very indistinct, body covered rather more thickly with sericeous pubescence. It differs at once in coloration and anterior tarsi. In the front tarsus the first joint has an expansion on outer side as wide as the joint; this expansion is mostly black. The clypeus, mandibles (except tips), scape, pronotum, tubercles, tegulæ, scutellum and post scutellum (each with borders laterally), most of the legs, and nearly entire dorsal surface of abdomen, yellowish. The flagellum is pale beneath; bases of femora and tips of tarsi dark, the basal half of the first abdominal segment, and the borders of the others narrowly black. The wings have yellowish-brown venation; the venation is on the same plan as in *L. errans*, except that the cubital cross-vein ends near the middle of the marginal cell, instead of plainly before.

Length, 4 mm.

From Tallac, Eldorado Co., Calif., (Giffard).

Rhopalum (Alliognathus) carolina sp. nov.

♀. Shining black, with fine appressed white pubescence, silvery on the clypeus and half-way up the orbits; scape beneath, front tibiæ and tarsi, mid-tarsi (except apical two joints), and the spurs yellowish. Structure in general similar to the western *A. occidentalis*, but smaller. The truncate projection of clypeus barely noticeable; frontal groove and ocellar depressions distinct; first joint of the flagellum barely longer than the second; fovæ at base of the enclosure very small and faint; the Y-ridge distinct and transverse ridges outside of it; hind tibiæ not serrate, but with a row of fine, short bristles; pygidium not very broad, truncate at tip; stigma dark brown, veins much paler brown.

Length, 5.5 mm.

From north fork of the Swannanoa River, Black Mts., N. Car., May.

Thyreopus rufibasis sp. nov.

♀. Black, clothed with sericeous pubescence, dense and silvery on the clypeus. Mandibles (except tip), clypeus, scape, pedicellum, first joint of flagellum, pronotum, tubercles, large spot below fore wing, tegulæ, scutellum, and spot each side in front, first and second segments of abdomen almost wholly, and very narrow spot each side on the third segment, yellow to rufous; the legs largely rufous, femora darkened through middle. Wings brownish, stigma yellowish, veins brown. First joint of flagellum plainly longer than the second; ocelli rather large, hind ones scarcely nearer eyes than to each other; pronotum smooth; dorsulum densely, finely punctate; scutellum more sparsely punctured; postscutellum striate; metanotum coarsely rugose, the groove broad in the middle, each side are several irregular areas, behind on each side is a lateral area which is crossed by two or three ridges, outside of the lateral ridges are a few foveæ; abdomen very minutely punctate, moderately slender, pygidium punctate and hairy.

Length, 9 mm.

From Gulfport, Florida, (Reynolds).

Blepharipus parkeri sp. nov.

♀. Black, more or less sericeous, most distinct on clypeus, but also on lower sides of head, mesopleura and tibiæ. Mandibles in part, scape beneath, anterior tibiæ in front, mid and hind tibiæ at base, front and mid basitarsi and the spurs pale whitish; sometimes a small spot on the pronotum. Wings with black stigma and venation. Enclosure of metanotum strongly marked and margined by impressed foveæ, the surface each side convex and polished, posterior face slightly rugulose at tip, nearly smooth above, lateral ridges distinct on lower half, and outside of it a foveate groove, the pleura smooth and shining. Abdomen polished, apical segments more sericeous, below with row of hairs at tip of each segment; pygidium dull punctate.

Length, 5 to 6.5 mm.

From Lexington, Mass., July. Nearest to *B. ater*, but distinct by the pale marks.

OXYBELIDÆ.

Oxybelus carolinus sp. nov.

♀. Closely similar in most respects to *O. packardi* Rbt.; it differs in that the spine is acute at tip, tapering throughout and the face is broader than in that species, the lateral surfaces of the propodeum are more completely striate; the upper part of the mesepisternum has no distinct oblique rugæ. There are no spots on the scutellum nor is the hind border of mesonotum pale; otherwise it is similar to that species and of the same size.

From Southern Pines, N. Car., May 29th, (Manee).

PHILANTHIDÆ.

Philanthus carolinensis var. **reductus** var. nov.

Polished black and marked with yellow about as in the typical form, but the scutellum has no mark, nor is there an interrupted band on the first abdominal segment, and in the female there is no spot on the pygidium. The first abdominal segment is a little more swollen above than in the type. In the male the hair on venter is mostly confined to the middle area of the last ventral, where it forms a dense transverse row, elsewhere the hair is sparse, (in the typical form the last two ventral segments are densely clothed with hair).

Length, 7 to 9 mm.

From Chesapeake Beach, Maryland, and Black Mt., N. Car. Both this and the typical form differ from *P. bilunatus* in the position of the interrupted band on the second abdominal segment; in the latter species the band is further back, and curves backward, moreover the bands on other segments are subinterrupted each side, and the pit on the metanotum is striate at bottom.

LARRIDÆ.

Tachytes pennsylvanica sp. nov.

♂. Related to *T. pepticus* of the west. Black with black legs, only about two or three joints of tarsi pale, front coxæ without spines and femora without groove. It is a larger and heavier insect than *T. pepticus*, the face of the male is broader below, and clothed with yellowish gray hair, white above near the ocelli, the hair on pleura and especially on the metanotum is much longer and denser than in *T. pepticus*. The clypeus has a broad projection in the middle; the metanotum with a dorsal groove. The third joint of the antenna is plainly a little longer than the fourth; the pygidium is clothed with white hair; the emargination of the ventral plate is broader than in *T. pepticus.*

Length, 13 mm.

From Rockville and West Fairview, Penna., July and August (Knull and Kirk).

Tachysphex maneei sp. nov.

♀. Resembles *punctifrons* in having long antennal joints, but with a narrower vertex, and the face clothed with a silvery pubescence; legs with black (instead of white) spurs; the head is more coarsely punctate than in *T. punctifrons* and the abdomen with four silvery bands. The lower edge of clypeus is evenly rounded; width of vertex about equal to second and third antennal joints together, much less than the third and fourth together, the third barely shorter than the fourth, this and all beyond longer than usual; dorsum of metanotum finely granulate, the sides finely striate; pygidial area slender, and sparsely punctate; marginal cell obliquely truncate. Color, wholly black.

Length, 8.7 mm.

From Southern Pines, N. Car., August 19, (Manee).

Larropsis distincta var. **semirufa** var. nov.

Structurally similar to the typical form, but in both sexes the basal two or three segments of the abdomen are bright red above. In the male the pygidial area is not silvery above as in the typical form, but is punctured in the same way. As large as the typical form, which it appears to replace in the north.

From Lexington, Dennis, Provincetown and Essex Co., Mass., in August and September, (Morse and Banks).

PSAMMOCHARIDÆ.

Psammochares eurydice sp. nov.

♀. Closely resembles *P. tropicus;* black, with reddish on second segment of abdomen extending partly over the first and third segments. Structure of thorax, legs, abdomen, and venation about as in that species; the hair on basal abdominal segment is shorter and the groove on metanotum is not as evident. It differs in that the head is much more narrow, the face at vertex is hardly as wide as the second and third joints of the antennæ together; the third joint of the antennæ is rather longer than in *Ps. tropicus*, the spines of the comb of front tarsi are rather shorter, and the ocellar triangle is more equilateral, the lateral ocelli a little nearer to the eyes than to each other.

Length, 13 mm.

From Spring Creek, Decatur Co., Georgia, July 16, (Bradley).

Psammochares sublaevis sp. nov.

♀. Black. Spines of comb of anterior tarsi very long and curved, as in *P. scelestus* and *P. astur;* third joint of antennæ very long, with the second about equal to vertex width, third and fourth joints subequal; vertex straight across; ocelli as in allied forms; pronotum angulate behind; metanotum rather short, no groove; legs slender and spined as in allied forms. Body throughout with very short hair or almost absent, that on head above antennæ hardly more than one-half as long as in *P. scelestus* or *P. astur,* below antennæ almost without hair; hair on mesonotum very short, that on metanotum fairly long, almost wholly absent from pleura, (which is very hairy in *P. scelestus* and *P. astur*); very few hairs on front of anterior coxæ, mid-coxæ with only few very minute hairs below, (prominent in *P. scelestus*, but not in *P. astur*). Wings black; both submarginal cells longer than high; first recurrent ends near tip of second submarginal, second recurrent bowed out, ends near middle of the third submarginal cell.

Length, 10 to 12 mm.

From Marion County, Indiana, and Sea Cliff, N. Y.

Lophopompilus carolinus sp. nov.

♀. Black, with a red mark on the second abdominal segment partly divided, as in *L. atrox*. Structurally similar to *L. atrox* in face, antennæ, thorax, legs and venation, but only about one-half the size of that species. It differs from *L. atrox* in that there is practically no hair on the pleura, only few fine, scattered hairs, while in *L. atrox* the pleural hair is long and dense; the hair on other parts of the body is, perhaps, a little shorter proportionally than in that species. The emargination of the clypeus is nearly as large as in *L. atrox*.

Length, 12 mm.

From Black Rock, North Carolina, September, (Sherman).

Batazonus flavipennis sp. nov.

Head mostly yellowish, darker in middle above the antennæ; antennæ pale on basal half, beyond dark; thorax mostly dark, hind and lower border of pronotum pale, and some pale on mesonotum and scutellum; abdomen mostly yellow, the basal segments darker on apical part; femora dark on basal half or more, beyond the legs are yellowish; wings yellowish, apex distinctly dark. Vertex rather narrow, not as wide between eyes as the length of third joint of antenna; lateral ocelli nearer to eyes than to each other. The spines in the comb of anterior tarsi are very long and rather flattened, as in *B. algidus* and *ferrugineus;* the clypeal suture is as in *B. algidus;* from this latter it is separated by the very different coloration.

Length, ♀, 20 mm.; ♂, 15 mm.

From Salt Lake, Utah (Garman) and Jemez Springs, New Mexico (Woodgate).

Pedinaspis mariæ var. **antennalis** var. nov.

Colored in general like typical *P. mariæ:* the thorax reddish, abdomen mostly reddish, basal segment rather darker, second with dark tip, third and fourth mostly black, pale on base, fifth and sixth with silvery sericeous hair; venter pale on base, black toward tip; wings marked as in *P. mariæ*, but the pale band broader and more distinct. It differs from *P. mariæ* in having the first and second joints of the antennæ reddish, and in the reddish clypeus; the legs are almost wholly black as in *P. mariæ*. The posterior face of the metanotum is transversely rugose, more than in *P. mariæ*. Smaller than that species.

Length, 11 mm.

Falls Church, Va., 28th July.

In *P. legatus*, which also has the basal joints of antennæ rufous, the whole head is also rufous, and the marks on posterior part of abdomen are different.

Pseudagenia floridana sp. nov.

♀. Metallic blue as in *P. coerulescens;* the head and antennæ rufous, the head with a large quadrate dark spot inclosing ocelli and reaching nearly to the base of the antennæ. Abdomen metallic bluish above, dull yellowish beneath. Legs with the tibiæ and tarsi black; the femora and coxæ rufous, the coxæ and the mid and hind femora with a dark spot or streak above. Wings nearly hyaline, tip darker; spurs black. Structure and venation similar to *P. coerulescens*, the thorax with silvery pubescence.

Length, 6 mm.

From St. Augustine, Florida, 17th April, (C. W. Johnson).

Pepsis novitia sp. nov.

♂. Related to *P. mildei;* black, iridescent purple, legs black, antennæ (except basal joints) yellowish; wings colored as in *P. chrysothemis*, broad basal and apical dark bands, no pale tips, middle yellowish, but not very bright. The fourth ventral segment has two oblique rows of long curved bristles (as in *P. elegans*), and on fifth segment lateral rows of erect hair, between these hair combs the surface of the fourth and fifth segments is polished and slightly depressed. The subgenital plate is elongate, somewhat hairy towards tip, and with a faint basal median carina. The metanotum is transversely wrinkled, no ridge separating the posterior slope, which is also partly wrinkled, the lateral angles fairly prominent, but dentate. Third cubital cell fully as broad as long. Size of *P. mildei*.

From Fedor, Lee County, Texas, 29th May, (Birkman).

Pepsis arizonica sp. nov.

♂. Black; abdomen bluish and parts of the head and thorax also in certain lights. Wings yellowish, about as in *P. formosa*, base and tip broadly black, but the black rather definitely limited, reaching to the third cubital cell, base not black as far out as in *P. ceberus* and *P. chrysothemis;* head and pronotum with long black hair, metanotum with shorter hair, the upper surface strongly striate across, and with a distinct longitudinal depression; suddenly declivous behind, the division marked by a median hump and lateral teeth; genital plate about one and two-thirds as long as broad, sides subparallel, tip deeply emarginate in middle, surface with few short hairs, base with a triangular tubercle, its apex running off into a median carina which extends nearly one-half way down the plate.

Expanse, 54 mm.

From Huachuca Mts., Arizona, (Biederman).

Pepsis augustimarginata Vier.

Palmerlee and Dragoon, Arizona. The male differs from *ceberus* in having the subgenital plate much more slender, the sides nearly parallel. The apex of the wings is only narrowly dark, and the base is dark hardly as far out as in *ceberus;* the metanotum has no distinct division between upper and posterior face, but is strongly striated, and densely clothed with long hair. The ventral hair-tufts are short, and with a wide free space between them.

The species of *Pepsis* which I have seen from our country can be separated by the following table:

1.	Wings black, or mostly so; not yellow or reddish	2
	Wings largely yellowish or reddish	5
2.	Antennae yellowish	*elegans*
	Antennae black	3
3.	Apical third of wings whitish hyaline	*venusta*
	Only a narrow apical margin hyaline	4
4.	Apical margin of hind wings not hyaline in the female; with front femora hairy beneath; male with the subgenital plate elongate and long-haired,	*obliquerugosa*
	Apical margin of hind wings narrowly hyaline in the female; front femora barely, if at all, hairy beneath; male with the subgenital plate short, and with a transverse carina, not noticeably hairy	*mexicana*
5.	Antennae with several joints yellowish or reddish	6
	Antennae wholly black	7
6.	Apex of wings broadly dark banded; male without apical fringe on the fifth ventral segment	*novitia*
	Apex of wings narrowly banded with dark; male with apical fringe to the fifth ventral segment	*mildei*
7.	Males	8
	Females	15
8.	Subgenital plate elongate, more or less hairy, without a median tooth or a transverse ridge	9
	Subgenital plate shorter, with median and apical transverse carinae, the median one curved at ends, the apical one tooth-like at each end; no ventral hair-brushes	*chrysothemis*
	Subgenital plate with a median tooth and an apical or subapical transverse ridge; no ventral hair-brushes	13
9.	No ventral hair-brushes	10
	Ventral hair-brushes present toward the tip of the abdomen	11

10. Subgenital plate slender, densely hairy; wing-tips hyaline .... *nephele*
Subgenital plate broad, emarginate at tip, scarcely hairy, wing-tips broadly dark .... *arizonica*
11. Fourth ventral segment with oblique hair-row or tuft; extreme tip of antennae black 12
Fourth and fifth ventral segments with hair-tufts; extreme tip of antennae reddish .... *boguei*
12. Subgenital plate more than three times as long as broad... *angustimarginata*
Subgenital plate about twice as long as broad .... *cerberus*
13. Wings not darkened near tip .... *pallidolimbata*
Wings plainly darkened before tip 14
14. Wing reddish .... *cinnabarina*
Wings yellowish .... *formosa*
15. Front femora with long hair beneath; very large species with the preapical dark band of fore wings broad and extending basally into the third cubital cell .... *nephele*
Front femora with few if any hairs beneath 16
16. The hind tibiae have the bristles among the spines much longer than the spines and curved; no distinct transverse ridge on metanotum separating upper and posterior surfaces .... *inermis*
The hind tibiae with bristles straight and not longer than the spines; metanotum with a distinct ridge separating the upper and posterior faces 17
17. The posterior part of pronotum very plainly hairy above 18
Posterior part of pronotum not hairy or scarcely so 20
18. Wings reddish, extreme tip pale; posterior face of metanotum striate across .... *cinnabarina*
Tips of wings wholly dark 19
19. Extreme tip of antennae reddish; tip of wing broadly dark; posterior face of metanotum not striate in middle .... *boguei*
Extreme tip of antennae black; tip of wing narrowly dark; posterior face of metanotum striate in middle .... *angustimarginata*
20. Wings without distinct preapical dark band; posterior face of the metanotum striate across .... *pallidolimbata*
Wings with apical or preapical dark band 21
21. Apical dark band to wings; posterior face of metanotum scarcely striate, *lucasi*
Preapical dark band, extreme tip pale; posterior face of metanotum striate across .... *formosa*

Three species not placed in the table have been recorded from the United States.

Pepsis charon Mocz.

Recorded from Texas, is similar to *P. elegans*, but the male has short hair on the fourth and fifth ventral segments.

Pepsis sanguiguttata Christ.

Recorded from Texas, is a West Indian species with dark wings on which is a stellate reddish spot.

Pepsis circularis Fox.

Close to *P. chrysothemis;* the subgenital plate is the same; it differs in that the sixth ventral segment is extended above to cover the sixth dorsal segment; but one male is known; it is from Texas.

MUTILLIDÆ.

Nomiaephagus oculatus sp. nov.

♀. Closely related to *N. simillima*, the head fully as broad, and the eyes much more than their diameter from the posterior corners; the thorax is less strongly constricted in the middle, and the posterior slope has the edges less dentate than that species. The coloring is about the same, except that on the abdomen the apical fringe of the second segment is pale, except for a small spot in the middle, where it is dark, (in *simillima* dark except extreme sides), and the pale on the top of the second segment is in the form of two circular spots, quite sharply marked.

Length, 10 mm.

From St. Marys, Georgia, March 6th–April 18th, (O. Bangs). Probably it is the form referred to by Fox from Florida, with the yellow in the form of rounded spots.

Dasymutilla alesia sp. nov.

♀. In the section of *D. cypris*, with an elongate tubercle extending toward eye; eyes moderately large, about their diameter from the apex of the tubercle. Head and thorax with appressed golden hair, and scattered, erect, mostly black bristles; those on the posterior slope of the metanotum are pale; first abdominal segment with pale hair on disc, at apex black, second segment with four large, sharply defined pale spots, the two in front are the smaller, the rest of the segment above deep black, with black hair, the apical margin black-haired, except the extreme sides; third segment black and black haired, except at extreme sides; fourth and fifth with pale hairs; pygidium rather closely and fully longitudinally striate. Carina of first ventral not prominent, an elongate tooth in front; scutellar scale distinct; no transverse carina at end of mesonotum; third joint of the antenna little shorter than fourth and fifth united. Legs pale, tarsi darker, with pale hair.

Length, 8 to 11 mm.

From Falls Church, Va., 13th August to 20th September.

Dasymutilla cypris var. **interrupta** var. nov.

♀. Agrees with *D. cypris*, except that the apical margin of the second abdominal segment is not wholly fringed with pale golden hair; there is a small, median patch of the golden hair, and each side of it is a longer area of black hair; the extreme sides pale-haired.

From Falls Church, Va., July and August.

The Eastern species of *Dasymutilla* that I have seen can be tabulated as below for the females. I have used several of Mr. Rohwer's names, although some may be only varieties, others however are surely distinct species. Mr. Rohwer has kindly examined several of my specimens and furnished notes on the structure of some of his types.

1. Hair of head, thorax and abdomen long and dense, red or yellow, the abdomen with a median band of black hair, large species........ 2

Hair of head, thorax and abdomen above more sparse, so that the sculpture can be more or less plainly seen; abdomen not red or yellow with a median black band, smaller species........ 3

2. Hair red........ *occidentalis*

Hair yellowish........ *comanche*

3. Temples with a tubercle or carina........ 4

Temples without tubercle or carina........10

4. Petiole quadrate, hardly thickened posteriorly; pygidium striate; second segment black haired at tip, others with pale hairs........ *rugulosa* Fox

Petiole plainly enlarged and thickened behind........ 5

5. Antennal scrobes carinate above; tips of second and third segments black-haired; pygidium striate; spurs pale........ *cariniceps* Fox

Antennal scrobes not carinate above........ 6

6. Hair at tip of first segment largely pale; at tip of second pale, with a median black patch........ 7

Hair at tip of first segment largely black; at tip of second segment either all black, or pale in middle; pygidial striae reach the tip........ 9

7. Temples with an outer carina; pygidial striae weak, hardly reach tip; metathorax strongly rugose; third joint of antenna but little longer than fourth........ *chattahoochei* Brad.

Temples with a superior oblique tubercle directed toward eyes........ 8

8. Pygidial striae strong, but do not reach the tip, eyes about diameter from tubercles; hair of metanotum pale........ *allardi* Roh.

Pygidial striae reach tip; eyes less than diameter from the tubercles; hair of upper part of the metanotum black........ *rubicunda* Brad.

9. Hair at tips of second and third segments mostly pale........ *cypris* Bl.

Hair at tips of second and third segments mostly black........ *alesia* n. sp.

10. Pygidium plainly striate longitudinally........12

Pygidium not striate longitudinally........11

11. Pygidium finely granulate; second segment with black hair in middle; no scutellar scale; head broader than thorax........ *obscura*

Pygidium irregularly rugose, or with short longitudinal rugae; second segment with a pale spot in middle of hind margin; first segment with black hair at tip; head not as broad as thorax........ *harmonia*

12. No scutellar scale........13

The scale present........15

13. Hair at tip of first segment pale, that at tip of second pale in middle, but a dark patch each side........ *finni* Roh.

Hair at tip of first segment black........14

14. A small spot of yellow hair in middle of apical margin of second segment, *blawa* Roh.

No such spot, hair of margin black........ *champlaini* Roh.

15. A transverse carina at tip of mesonotum........17

No such carina........16

16. Hair at tips of first and second segments pale........ *sappho* Fox

Hair at tips of first and second segments black........ *zella* Roh.

17. Tip of second segment with black hair........ *ferrugata* Lep.

Tip of second segment with a pale median spot; eyes larger in proportion to head........ *georgiana* Roh.

D. ferrugatella Rohwer is practically the same as **D. zella,** in the former the erect hair of head is paler, and that on the apical segments of abdomen white, while in the latter species the erect hair of head is dark, and the hair on apical segments more yellowish.

D. mutata Blake, as I have identified it, is but a form of **cypris** in which the apical hair of abdomen is white, instead of the pale golden of **D. cypris.**

D. plesia Rohwer, I have not seen, but is said to agree with **D. ferrugata,** except that the third joint of antennæ is shorter.

D. errans Rohwer runs to **sappho,** except that there is a median patch of black hair on apex of second segment.

D. segregata differs from **D. champlaini** in shorter thorax, and longer second segment. I have not seen it.

D. virginica Rohwer and **D. carolina** Rohwer I have not seen. According to Rohwer (in litt.) both have the scutellar scale, and lack the carina at tip of mesonotum. They would therefore come close to **D. zella,** but appear to be larger; but I have specimens I believe to be **zella,** which are fully as large and agree with description of **virginica.**

D. vierecki Rohwer agrees with **zella,** except that there is no ventral carina on first segment. Although the shape of this carina varies in **D. zella,** I have seen none without it.

A STUDY OF THE BIOLOGY OF THE CHRYSOPIDÆ.

By ROGER C. SMITH,
Assistant Professor, Kansas State Agricultural College.

There is much of biological interest to be found in the life history of the Chrysopidæ. The group is a very homogeneous one, varying little in morphology and habits. They are of wide distribution, and one or more species in all localities visited can be appropriately classed among the most common insects. Several species are somewhat rare and difficult to collect, hence, the biological data available concerning these is still somewhat fragmentary. This brief paper is a summary of a large detailed paper, the publication of which has been unavoidably delayed.* A full report of this work is now awaiting publication as a thesis for the doctorate in the memoir series of the Cornell University Experiment Station. This report will be amply illustrated.

LIFE CYCLE.

The total life history of the Chrysopidæ requires a period of approximately 25 to 50 days. Cold weather in the late fall or early spring greatly retards growth and development. From 4 to 12 days were required for embryonic development, the eggs hatching in midsummer in four to six days after deposition. The first molt occurs in three to seven days, or, in cool weather, in 11 days after hatching. The second molt occurs at an interval of two to seven days, the majority molting three and four days after the first molt. The third instar may vary greatly in time. Sometimes it is much prolonged, especially if food is scarce. But from the second molt to spinning the cocoon, there is usually a period of 4 to 10 days, the majority requiring five or six days. The final larval molt to the pupa occurs within the cocoon 5 to 12 days after spinning. However, in the case of overwintering generations, which remain in the cocoon as prepupæ, this molt does not occur for a period of four to eight months after spinning. The pupa emerges from the cocoon in a minimum of 10 days after pupation. The pupal molt is at once shed and a full-fledged adult appears which may oviposit after a period of three to six days.

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* The writer has been studying the Chrysopidæ intensively for about five years. During this time some or all of the immature stages of fifteen species have been seen. Collections and rearings have been made at Ithaca, N. Y., where this work was begun under the direction of Professor James G. Needham, of Cornell; at Dayton, Ohio; at Milwaukee, Wisconsin; at Charlottesville, Virginia, and at Manhattan, Kansas. Through the courtesy of Dr. Nathan Banks, the Fitch, Hagen and Banks' types at the Museum of Comparative Zoology, at Cambridge, Mass., were studied.

THE EGGS.

The eggs of our Chrysopidæ, as is well known, are stalked, the stalks ranging from about four to eight millimeters in length in the different species. The stalk is composed of a gelatinous substance exuded at oviposition, which hardens quickly after being drawn out into the usual form. The eggs are elongate, ellipsoidal, and light green to distinctly greenish yellow in color. *Chrysopa nigricornis* Burm. has the longest stalks of any eggs seen, and *C. quadripunctata* the shortest. The stalks apparently vary directly as the length of the abdomens in the different species. The eggs of *C. nigricornis* are deposited on the leaves of the trees, maples by preference, and are nearly always in rather closely arranged groups, with the stalks somewhat tangled or entwined. Single eggs of this species are not uncommon, however. The other species deposit their eggs in less closely arranged and often regular groups, in rows or singly. The place of oviposition, the size of the egg, the length of stalk, and the coloration serve in practically all cases to identify the eggs of the different species.

Many abnormalities occur in oviposition which have not been described. Some of our most common species which normally deposit stalked eggs, may, under certain conditions, deposit stalkless eggs, eggless stalks, stalked eggs attached to other eggs or to their stalks. Three eggs of *C. chi* were found with their stalks united into one at about midway. In the case of our common species, these can be explained as accidents occurring during oviposition.

Oviposition has been correctly described, at least in the main, by several writers. No differences of importance have been observed in the different species. No difficulty was experienced in obtaining large numbers of eggs when the adults of our most common species were confined in vials and fed daily on plant lice. Most of this work has been carried on with

C. oculata and *C. nigricornis*. Some species, on the other hand, have consistently refused to oviposit in captivity and could not be kept alive more than a few days.

In the process of hatching, an egg burster serves to cut the initial slit in the chorion. This process has been recently described by the author and the published account will soon appear.

THE LARVÆ.

Chrysopid larvæ are generally described as spindle shaped. They are thysanuriform, exhibiting at the same time a quite primitive type with some remarkable specializations. Among the latter are the anal silk glands and the sucking mouth-parts. The maxillæ and mandibles are greatly prolonged forward, forming the so-called sickle-shaped jaws. The two halves are mechanically fastened together by means of a flange on the outer edge of the maxillæ working in a groove in the mandibles. A tube extends between them to the pharynx. The mandibles are quite pointed and the whole is well suited to puncturing the bodies of insects. The juices are taken up by suction effected by a heavy pharangeal musculature and by short muscles within the maxillæ which by their contraction dilate the tube leading to the pharynx.

The three parts of the thorax are each divided into two parts or subsegments. The anterior subsegment of each is much smaller than the posterior one. The posterior subsegment in all but the first and last two or three segments bears a pair of more or less prominent lateral tubercles which are beset in the third and last instar with 12-20 strong setæ. The abdomen in all species seen has ten segments. Considerable difference of opinion has arisen concerning this point. The first segment, which is short and without the lateral lobes, has been overlooked by some. It is distinctly marked by the first pair of abdominal spiracles. The last two segments are tubular and partially invaginated within themselves. The terminal segment is applied to the substratum in walking. A clear, gelatinous fluid, secreted by anal glands, gives the larva security in climbing smooth surfaces. It is well known that the larvæ of this family void no excrement. The mid intestine is closed at its posterior end. The hind intestine is quite small, in cross section appearing no larger than a malpighian tubule. The excrement is stored in a large bean-shaped mass in the mid-intestine, and is voided by the adult immediately following the pupal molt to the adult.

The food of the larvæ is predominantly aphids. They exhibit little choice between the different species of aphids, though some are more suitable for feeding them in rearings than others. Other small or soft bodied insects, as Jassids, Capsids, Coccids, small Diptera, and many kinds of insect eggs have been used in rearing work.

The classification and identification of the larvæ of the various species is no more difficult nor complicated than the identification of adults. Most published descriptions of larvæ are inadequate for naming or placing them in a key. The black spots on the dorsum of the head serve to divide the larvæ into three groups, which in the main are most closely related as adults. The first group has two longitudinal and converging spots on the head as in the case of the following species of the genus Chrysopa; *plorabunda*, *rufilabris*, and *interrupta*. *C. bimaculata* has two narrow, black bands on the head, but they extend cross-wise and the larva is a trash carrier. The next group has three black triangular spots on the dorsum of the head. This is characteristic of *C. oculata*, (which includes the two nominal species *albicornis* and *chlorophana*, which the writer places in synonomy with *oculata* on the basis of rearings), *C. chi*, (including also the nominal species *ypsilon* also placed in synonomy with *chi*), and *C. nigricornis*. The next group have four long, narrow bands on the dorsum of the head, a short inner pair, and a longer outer pair arising at the bases of the antennæ and extending to the anterior border of the prothorax. This group contains the trash carriers, *Chrysopa lineaticornis*, *lateralis*, an unidentified species now being reared at Manhattan (thought to be *cockerelli*) and *quadripunctata*. In connection with the latter species, observations at Charlottesville, Virginia, clearly showed this species to be a transition in the trash carrying habit between the true trash carriers and the naked larvæ. Specimens were found with considerable debris on their backs, but it was not definitely arranged into a neat packet. There are more short, minute setæ on the dorsum than in the naked larvæ proper, which suggest the hooked dorsal setæ of the trash carriers.

To identify larvæ to species, the following features have been found useful in addition to the dorsal head spots; first, the general coloration of the larva, including the color, shade of color, whether solid or spotted, the markings either side of the dorsal vessel, the markings in the lateral border, and the color of the jaws and legs; and second, the size and shape of the lateral tubercles, the color and comparative size of the setæ on the same, the comparative length of the stalks of the lateral tubercles and the coloration of the same. The presence of lateral tubercles on the first abdominal segment is useful, especially in the case of *nigricornis*, which possesses them. Furthermore, if the larva carries a distinct packet, identification is simplified, for there are only a few species known to be trash carriers.

Chrysopid larvæ can be readily separated from the larvæ of the Hemerobiidæ, which they resemble closely by the following differences. Hemerobiid larvæ are generally more slender, the first subsegment of the prothorax being especially longer than in the Chrysopidæ, as is also the case with the last two segments of the abdomen. When the larvæ walk rapidly the end segments of the abdomen are lifted and carried horizontally, while the head sways from side to side with a rapid jerky motion. The prominent trumpet-shaped pulvillus which occurs on all species of Chrysopidæ seen by the writer or figured in texts is absent in the Hemerobiidæ. The lateral tubercles are also absent in the Hemerobiidæ. The dorsal and lateral setæ of the latter are very short and inconspicuous, except on the last few abdominal segments. The jaws are heavier and more nearly straight than in the Chrysopidæ. In most species they come to a point rather abruptly. No known species of Hemerobiidæ are trash carriers.

It is frequently said that Chrysopid larvæ cover themselves with the skins of their victims. In the experience of the writer, this habit is confined to a few species of trash carriers which regularly construct a neat hemispherical packet of aphid skins, insect molts or parts of insect's bodies, spider's webs, plant fibers, lichens, and other similar materials.

The writer has seen four species of trash carriers. *C. lineaticornis*, *C. bimaculata*, *C. lateralis*, and a species in Kansas now being reared. *Allochrysa parvula* Banks and *Leucochrysa floridana* Banks are in all probability trash carriers, judging from the cocoons of these species seen at the Museum of Comparative Zoology, Cambridge, Mass. All three instars have these packets, which are constructed anew after each molt. The morphology of the larvæ is considerably modified and specialized for carrying the packet. The abdomen is much shorter, but broader and thicker than in the naked larvæ, causing it to be arched conspicuously from the first to about the seventh segment. The lateral abdominal tubercles are rather small, fleshy lobes without clearly defined stalks and the setæ are likewise short. The dorsal setæ are present and fairly prominent. In the Kansas species there has been observed one to three rows of microscopic hooked setæ on each abdominal segment from one to six, inclusive. There are six in the shortest rows and about thirty in the longest rows. The tips are bent downwards and serve to hold the packet in place. It has been usually stated that there is a gelatinous substance on the setæ holding the debris in place. The writer has not found such a secretion, but would explain the firm security of the packet on the dorsum as due to these hooked setæ, assisted by the larger dorsal and lateral setæ. The thoracic tubercles have stalks much longer than is the case in the naked larvæ, and the setæ on the first two pairs extend outward in a fan-shaped manner, turning upward at the tips. This provides an even and firm support for the anterior rim of the packet. All four of the packet bearers seen are somber gray larvæ, with little of a color pattern. All but *C. bimaculata* have the two pairs of dorsal head bands and in the last instar have posterior spots which suggest a third pair.

The first instar of all Chrysopid larvæ can be distinguished by the presence of two large setæ on each lateral tubercle except the mesothoracic and metathoracic tubercles, which bear three each. The dorsal head spot in the first instar of *C. chi*, *C. oculata*, and the varieties of each, breaks up into three spots in the third instar. In *C. nigricornis* there are three spots of the same pattern as in the preceding on the dorsum of the head in all instars.

THE PUPA.

Grown larvæ normally spin silken cocoons in which to transform. The silk is produced by modified malpighian tubules and is spun through the anus. Some larvæ fail to spin a cocoon, a few apparently making no effort to spin. If the larvæ are disturbed while spinning, they frequently fail to spin further or many spin a mat of silk upon which to transform. Larvæ have repeatedly passed through the pupal stage outside of a cocoon and one specimen wintered without this protection. The cocoons are usually placed near the feeding habitat, i. e., the tree inhabiting species, spin their cocoons on the under side of leaves or under bark. In the case of *C. oculata* it is believed that they generally spin their cocoons just under the loose earth on the ground. Cocoons of this species are not often found on plants in the field. The trash carriers use their packet as a kind of foundation or starting point for their cocoon. It adheres to one side of the finished cocoon.

The main facts concerning the spinning of the cocoon have been noted by several writers, but some interesting details have been overlooked. The larva first forms a framework by attaching the viscid silk thread to whatever supports are near. It requires an hour or more to complete the foundation, depending on how much time has been wasted seeking places to attach the thread. The larva shifts its position frequently so that the cocoon soon assumes a spherical shape. The spinning pattern during the formation of the greater part of the cocoon is a rather constant triangular design. The larva shifts each time a little to one side of a true circle, so that the wall of the cocoon is of approximately uniform thickness throughout. As the larva turns in its cramped quarters, the dorsal and lateral setæ are broken off and are spun into the cocoon structure. The triangles of the spinning pattern grow smaller and the movements of the larva become slower. The final spinning appears to be a general plastering over of the inner wall of the cocoon. This is effected by a copious silk secretion being spread by the last segment of the abdomen. The cocoons are completed in most cases in about 24 hours, some requiring a little more time, a few finish in less time.

Especial effort was made to observe the manner of emergence from the cocoon, but with only partial success. It is believed that the circular lid through which the pupa emerges, tears in that peculiar manner as the result of the spinning pattern, and that it is torn by internal pressure exerted by the pupa. The writer is not positive whether the large pupal mandibles assist in starting the tearing at emergence; in his opinion it is possible that they may assist but probably not necessary. It has been observed in the more transparent cocoons of *rufilabris* and *plorabunda* that the pupæ within the cocoons are capable of shifting their positions very easily and rapidly.

Just before emergence, the pupal coloration and characters can be seen rather clearly in most cocoons. The pupal disc is the old larval molt and immediately before emergence is quite black. The golden or brownish eyes of the pupæ can be seen, while the general color of the cocoon changes from the pearly gray or white of the newly spun silk to yellowish in *quadripunctata* to a distinct green in *harrisii*.

THE ADULT.

The chief points of importance in connection with the adult which it is desired to describe here are the length of life, number of eggs laid, food, and ecological distribution. It is usually stated that the adults are short lived. Some of the less common species could not be kept alive in captivity longer than a few days to a week at the most, but, of the commoner species, two females of *C. oculata* lived 42 and 34 days, depositing 617 and 470 eggs, respectively. Dissections showed that neither had deposited their full quota of eggs. These are records in both cases. Adults of *C. plorabunda* have been be kept alive over winter. *C. rufilabris* and *C. harrisii* were also kept alive from late September until the latter part of December. Overwintering specimens can be distinguished from normal specimens by the brownish color which replaces the green, a change brought about comparable, it is thought, to the discoloration in autumn leaves.

Some confusion exists concerning the feeding habits of adults. Specimens of *oculata, rufilabris, nigricornis, plorabunda, chi,* and *quadripunctata* were kept alive for relatively long periods by daily feedings with aphids or weak sugar solution, and water. Our common species feed upon aphids, without doubt, and other small, soft bodied creatures. It is believed that the adults feed upon approximately the same species of aphids as the larvæ of the same species. This explains why adults go to aphid infested plants to oviposit rather than the doctrine of parental solicitude for the young. Adults of *lineaticornis, harrisii, cockerelli, Meleoma signoretti,* and other less common species could not be kept alive very long on common aphids. It was thought that their particular kinds of food were not supplied, rather than that they took no food. It is therefore held that the economic importance of this family is much greater than has been usually stated.

Fairly definite habitats were observed in the species studied. *C. oculata* and varieties are the most common and most widely distributed garden and field types. *C. plorabunda* is here our most abundant field species. *C. nigricornis*, *C. rufilabris*, *C. harrisii* and *C. lineaticornis* are tree forms. *C. harrisii* is especially partial to pine, while *lineatricornis* and *quadripunctata* seem to prefer oaks. *C. nigricornis* and *rufilabris* are found on a variety of trees, but maples probably predominate. Adults can best be collected by beating the bushes with a long stick and then catching the adults with a net as they fly out into the open.

COLORADIA PANDORA BLAKE, A MOTH OF WHICH THE CATERPILLAR IS USED AS FOOD BY MONO LAKE INDIANS.

By J. M. Aldrich,
U. S. National Museum.

In 1911 I made some fragmentary observations on this hitherto unreported Indian food, which I published the following year in the Journal of the New York Entomological Society (vol. xx, pp. 1-4, plate i). At that time I had obtained only the dried larvæ ready for cooking, and the species could not be determined. My account of the methods of the Indians in collecting and preparing this food was obtained from the clerk of the Mono Lake store, and not written down until two or three days later. No further information came to light for several years, but in 1919 I interested Mr. Roy Headley, of the Forest Service, in the matter again, and he caused some inquiries to be made in the vicinity of Mono Lake. The Indians then stated that the caterpillars occur only every alternate year, and there would be none in 1919. In 1920 Mr. Headley interested Mr. Guy S. Way, of Bishop, Cal., ranger in the Inyo Forest adjacent to Mono Lake, who took hold of the subject with enthusiasm, wrote several letters on his observations, and sent a liberal shipment of the caterpillars, which settled the identity of the species. From Mr. Way's letters I compile the following account, making a few direct quotations. It will appear at once that my earlier article contains several serious mistakes.

The Indians call this food Pe-aggie. The first step in the collection of the caterpillars is to make a trench about the base of each tree, the outer edge of the trench as nearly vertical as possible. This is to keep the caterpillars from straying away when they come down the tree. The Indians go from tree to tree in the collecting season and pick them up out of these trenches. The next process is to kill and dry them. A large mound of dry earth is made and a fire built about it. When it is thoroughly heated, the fire is removed, the mound opened, the caterpillars thrown in and mixed with the hot dirt. Here they remain an hour, until partly cooked and dried. The Indians then sift them out of the mixture with a specially made, cone-shaped sieve, so that the insects are free from dirt. The drying is finished by spreading them on the ground in bark huts for two days, after which they are sacked and keep indefinitely in a cool, dry place. The material which I bought from a squaw at Mono Lake in 1911 is still in perfect condition; in fact, I think the odor improves with age.

This is an important food of the Indians about Mono Lake, in spite of the fact that it only lately came to the notice of the whites outside the immediate region. Mr. Way reports that Chief Jake Garrison put up a ton and a half this past summer, in the woods just south of Mono Lake. He says the caterpillars are regarded as a great delicacy, and only a few at a time are used to flavor a stew. In the case already reported by me, however, it appeared that the stew was made entirely of caterpillars; I found the larvæ tough and the stew insipid from lack of salt, the flavor resembling to my palate the taste of linseed oil. I could not from my own experience pronounce it a delicacy; however, *de gustibus non et disputandum.*

Now regarding the life history of the insect. The species is *Colorado pandora* Blake, as above indicated. It was determined by Mr. Wm. Schaus. The foodplant is Pinus jeffreyi. The life cycle of the moth occupies two years, and there is only one brood in the section where the observations were made. This fact has been understood by the Indians from time immemorial, so they count on putting up pe-aggies every other year.

The eggs are laid "in rough, sheltered places in the bark of the pine trees." This is about the latter part of April. On hatching somewhat later, the larvæ ascend the tree and feed on the needles during the short summer of that high altitude (about 7000 feet). By fall they are in the tops of the trees, where "they form a ball in the pine needles—a ball of pe-aggies, not a ball of pine needles, but they form this among the needles." "I have seen them thus many times in falling timber for sawmills in early spring, in Jeffrey pine belts only."

Thus they hibernate, enduring a cold winter with considerable snow. In their second summer they grow rapidly and are through feeding by July first. Then they descend the tree-trunks, and if they escape the Indians, they scatter and dig into the ground to pupate. We received Mr. Way's shipment on July 22nd, and several had pupated on the way; all the rest that were uninjured pupated within a day or so after being placed in rearing cages. None spun any silk whatever. Several adults came out in about two weeks after the specimens arrived, but this premature emergence was probably due to the rough usage of their long trip, which included sixty miles or more by team or auto to get to the railroad. Most of the pupæ are now dormant, and evidently will yield the adult in the spring.

MINUTES OF THE ANNUAL MEETING.

The Fifteenth Annual Meeting of the Entomological Society of America was held in Chicago, Room 20, Kent Hall, University of Chicago, on December 27th and 28th, 1920.

First Session.

The meeting was called to order at 2 P. M., December 27th, by the Secretary, in the absence of the President and Vice-Presidents. Attendance 35, increasing to 70 in the course of the session. Professor W. A. Riley was elected President *pro tem* and took the chair. The following papers were read:

The Immature Stages of Some Chrysopidæ............R. C. Smith
Notes on the Immature Stages of Cladura flavoferruginea O. S... C. P. Alexander
Wing Venation of Coleoptera.......................S. A. Graham
The Caterpillar Used as Food by the Mono Lake Indians, J. M. Aldrich
A Peach-deforming Capsid (read by P. J. Parrott)...Hugh Glasgow
Notes on the Ancestry of the Thysanoptera and Hemiptera-Homoptera (read by C. P. Alexander)........G. C. Crampton
The Attraction of Chloridea obsoleta to the Corn Plant.......... J. W. McColloch
Distribution and Habits of Cicadellidæ on Presque Isla, Pa...... J. G. Sanders and D. M. DeLong

The chair appointed the following committees:

Auditing—Hinds, Bentley, Rogers.
Resolutions—Satterthwait, Chapman, McIndoo.
Nominating—Osborn, Melander, Swaine.

At 4:40 P. M. the session adjourned.

Second Session.

The Society was called to order at 10 A. M., December 28th, by First Vice-President F. E. Lutz.

This being the business session, the Secretary presented for the Executive Committee the Reports of the Secretary and Treasurer and the Managing Editor of Annals.

Secretary's Report, 1920.

The following members have died during the year:

Dr. C. Gordon Hewitt.
Wilbur Ross McConnell.
Miss Caroline Gray Soule,

The following have resigned:

Dr. Johannes Dewitz.
Mrs. W. R. Thompson.
Dr. A. Fenyes.
Dettmar W. Jones.
Prof. J. E. Guthrie.
Total, 9.
Geo. O. Day.
Howard L. Clark.
F. V. Green.
V. L. Wildermuth.

Dropped from the list for non-payment of dues: Foreign, 18; American, 35. Total, 53. This is an unusual number, as on account of war conditions many names were not dropped in the last two or three years that would ordinarily have been.

Total losses, 66.

The following were voted into membership by the Executive Committee on June 6, 1920.

Wm. E. Hoffman.
Hugh W. Bedford.
Edwin H. Bryan, Jr.
John L. Buys.
Melvin H. Hatch.
Gladys Hoke.
Amy de Horrack Fournier.
Wesley O. Hollister.
Total, 15.
Hugh C. Huckett.
Percy Ireland Lathy.
Leonard M. Peairs.
Fred Schwarz.
Chas. K. Sibley.
Ralph P. Thompson.
B. W. Wells.

Elected at the present meeting:

Alfred B. Baird.
Walter B. Balduf.
Lulu Berry.
Stanley W. Bromley.
John D. Detwiler.
Grace H. Griswold.
Marshall Hertig.
Harry E. Jaques.
Donald S. Lacroix.
O. C. McBride.
Don C. Mote.
Evelyn Osborn.
Total, 24.
Faustino Q. Otanes.
Geo. B. Pearson.
Max M. Ruher.
Rudolf G. Schmieder.
Raymond C. Shannon.
Jas. M. Swaine.
O. H. Swezey.
R. J. Tillyard.
Leopoldo B. Uichanco.
Milton F. Webster.
Roscoe W. Wells.
Karl H. Wendler-Funaro.

On December 21st, when the books for 1920 were closed, it was found that the members had paid dues as follows:

Paid for 1921	281
Paid for 1920	183
Paid for 1919	35
Owing more than 1 year	37
Life Members	11
Honorary Fellows	6
Total membership	543
Elected this meeting	24
Actual present membership	567

Respectfully submitted,

J. M. ALDRICH,
Secretary-Treasurer.

December 21, 1920.

TREASURER'S REPORT, 1920.

RECEIPTS.

Balance last Report	$1,235.56	
Dues from members	1,064.50	
From Managing Editor of Annals	319.92	
Interest—Current Account	16.73	
Permanent Funds	30.90	
Total		$2,667.61

DISBURSEMENTS.

Printing Annals for 1919:		
March	$ 177.36	
June	295.77	
September	259.41	
Engraving for Annals	125.73	
Secretary's Office:		
Postage	11.00	
Printing	22.24	
Clerical Assistance	40.00	
Safety deposit box, one-half	2.50	
Cash Book	1.65	
One Liberty Bond	50.02	
Loss on exchange	.29	
Balance, cash on hand	$1,681.64	
Total		$2,667.61

NOTE—On account of not being able to get the printers of Annals to submit their bills, we now owe for December, 1919, and all of 1920, which accounts for our large cash balance.

CONDITION OF PERMANENT FUNDS.

On hand, last report	$794.01
Appreciation of nine War Savings Stamps	1.08
Total	$795.09

In this valuation the Liberty Bonds are estimated at their face value.

SECURITIES HELD.

First Liberty Loan, No. B00911757	$ 50.00
Second Liberty Loan, No. B02787752	50.00
Third Liberty Loan, No. 5876278	50.00
Third Liberty Loan, No. 5876279	50.00
Third Liberty Loan, No. 5876280	50.00
Third Liberty Loan, No. 4203250	100.00
Third Liberty Loan, No. 4203251	100.00
Fourth Liberty Loan, No. 490434	100.00
Fourth Liberty Loan, No. 4714709	50.00
Fourth Liberty Loan, No. 6951394	50.00
Fourth Liberty Loan, No. 14145891	50.00
Victory Liberty Loan, No. A1562358	50.00
Nine War Savings Stamps, present value	40.23
Balance, carried in Current Fund	4.86
Total	$795.09

Respectfully submitted,

J. M. ALDRICH,
Secretary-Treasurer.

December 21, 1920.

REPORT OF THE MANAGING EDITOR.

It may be said that the conditions for publication of the ANNALS have been somewhat as in the previous year and delays in the appearance of the various numbers has been due to difficulty in the matter of paper and printing, which we hope will be improved for the coming year. The Managing Editor has endeavored to secure the opinion of other members of the Editorial Board and of the Executive Committee with reference to the policy of increasing the subscription price and membership fee so that a larger journal may be issued with the result that no very definite conclusion can be offered at present. The Editorial Board would all like to see a larger and more fully illustrated journal but do not all agree as to the advisability of increasing the price of the journal. While there seems to be good argument in favor of increasing the price so as to correspond with other journals of about equal size and probably somewhat nearer the same circulation, we must recognize the possibility of a reduced circulation if the price is much increased and it would seem wise if any increase is made that it should be made large enough to offset any possible shrinkage in subscriptions or membership.

The expenses of the office have been kept down to a very moderate figure, smaller perhaps than can be expected in the future; however, accounts that will be due for reprints issued will help somewhat in the coming year's accounts. We have been favored by a number of the authors of papers in the current year's volume who have agreed to meet the cost of plates and in a few instances have paid for some additional expenses for their published articles. This has made it possible to issue a number of articles much more promptly than would have been possible without such assistance.

The character of papers which have made up the year's volume will, I believe, compare favorably with preceding years and with other journals and I trust that the members will appreciate that the interests of the society are very broad and that while certain articles may seem quite uninteresting to them individually that there may be other members who will find them distinctly interesting. As our society is organized to cover both North and South America and as the members are interested in fauna of related regions it is evident that along with the distribution in the different orders of insects there will be a pretty wide distribution of subject matter. It is also desirable to include papers of ecological character and those relating to morphology or general biology since few of the journals give much space to matter of this kind; in short, there seems every reason to consider the contents as covering a very broad field of Entomology.

The receipts of the office have amounted to $381.25 and the office expenses paid directly from this office have been $61.33. The balance of $319.92 has been transmitted to the Secretary-Treasurer as shown by accounts and vouchers submitted. The itemized statement may be briefly summarized as follows:

RECEIPTS.	
Subscriptions	$262.50
Sale of back volumes	95.25
Reprints and engravings	23.50
Total	$381.25

DISBURSEMENTS.	
Postal Deposits and Stamps	$ 35.54
Clerical assistance and labor	18.80
Supplies and exchange	6.99
Balance paid to Treasurer	319.92
Total	$381.25

Respectfully submitted,

HERBERT OSBORN,
Managing Editor.

The Secretary also reported that the Executive Committee had re-elected Prof. Herbert Osborn as Managing Editor, and had elected the following on the Editorial Board: WILLIAM S. MARSHALL, V. L. KELLOGG, F. E. LUTZ.

The report of the Treasurer of the Thomas Say Foundation had not been received*; the Editor of the Foundation, J. M. Aldrich, made a verbal report to the effect that the prospect is improving for the printing of a second volume by the Foundation, and asking the members to bring desirable manuscripts to his attention.

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*It is appended to the Secretary's Report on the following page.

REPORT OF TREASURER OF THE THOMAS SAY FOUNDATION
FOR THE YEAR 1920.

RECEIPTS FOR 1920.

Balance on hand January 1st, 1920		$210.93
3 Subscribers at $2.55	$ 7.65	
5 Subscribers at 2.25	11.25	
20 Subscribers at 3.00	60.00	
28 Volumes sold		78.90
Interest on $200 Bonds (to September 15)		8.50
Total Receipts, 1920		$298.33

EXPENDITURES FOR 1920.

Printing Cards (pd. Mch. 4)	$ 7.00
Postage on 28 Copies	3.92
Total expenditure, 1920	$ 10.92
Cash on hand to balance	287.41
Total	$298.33
Balance on hand January 1, 1921	$287.41

Volume I Sarcophaga & Allies has now paid for the net cost of publication and distribution with a balance of 41 cents in its favor. Of $287.41 now on hand, $260.00 belongs to the original endowment, leaving a cash balance of $27.41 on hand as an offset against the original grant of the Society of $50.00 for the establishment of the *Foundation*. Of the original edition of this Volume, 200 copies were bound and of this number, 19 were distributed to the collaborators of the author, 35 to the subscribers to the Foundation and 143 have been sold, making a total of 197 *copies distributed* to date.

Respectfully submitted,

(Signed) E. D. BALL,
Treasurer.

The Auditing Committee made the following Report:

Your Committee finds the Report of the Managing Editor, showing a total of $381.25, to be correct and properly checked by vouchers except in two small items, amounting to $1.83.

Second, your Committee has carefully examined the account of the Treasurer and finds the same to be well kept and correct, vouchers being presented for all items except: (List omitted, as these mislaid vouchers were all submitted to the Chairman of the Committee later.)

Third, as to the Statement of Permanent Funds, the Treasurer's Report is accepted without evidence as to securities held, as it is manifestly undesirable to transport them to the meeting.

W. E. HINDS, *Chairman.*
G. M. BENTLEY.

On motion the report was adopted.

The Committee on Resolutions reported as follows:

Your Committee on Resolutions begs leave to submit the following resolutions:

That the Entomological Society of America desires to express to the authorities of the University of Chicago its hearty appreciation for the use of the rooms and the facilities placed at its disposal for the purpose of its annual meeting, and that the Secretary send a copy of the resolutions to the authorities of the University of Chicago.

That the Society keenly feels the loss of our members, Dr. C. Gordon Hewett and Prof. Wilbur Ross McCowell and Miss Caroline G. Soule, whose deaths occurred during the past year. It wishes to express its appreciation of the lifelong work of these members who contributed so much to the advancement of the science of Entomology. Therefore, it instructs the Secretary to write letters of condolence to the families of our deceased members.

Respectfully submitted,
ROYAL N. CHAPMAN,
A. F. SATTERTHWAIT,
N. E. MCINDOO.

On motion the report of the Committee was accepted.

The Executive Committee referred the subject of increase of dues to the Society without recommendation. It appeared that the mail ballot taken by the Secretary in connection with sending out the annual notices had resulted in the following vote:

Favoring three dollars	144
Favoring two dollars	68
Not expressing preference	31

After considerable discussion the sentiment appeared to be in favor of waiting another year to see what the trend of printing costs will be, before making a change from the present rate of two dollars per year. So no motion was made and the matter laid aside for the reading of papers. The following were read:

Life History Notes on Some Forest Homoptera	HERBERT OSBORN
A Review of the Known Fulgoridæ of Eastern North America	Z. P. METCALF

At noon the session adjourned.

Third Session.

The meeting was called to order at 2 P. M., December 28th, by President L. O. Howard.

The Executive Committee reported that they have elected the following additional Fellows of the Society:

C. P. Alexander.
Prof. Mario Bezzi, Turin, Italy.
C. L. Metcalf.
W. D. Funkhouser.
T. J. Headlee.
Warren Knaus.
J. McDunnough.
Edna Mosher.
J. G. Sanders.
V. E. Shelford.
Prof. F. Silvestri, Portici, Italy.
P. S. Welch.
Wm. Schaus.
Carrington B. Williams.

The Nominating Committee reported the following nominations of officers for the coming year:

President—J. M. Aldrich.
First Vice-President—Arthur Gibson.
Second Vice-President—E. C. Van Dyke.
Secretary-Treasurer—C. L. Metcalf.
Additional Members Executive Committee—E. M. Walker, F. E. Lutz, W. A. Riley, O. A. Johannsen.
Committee on Nomenclature—E. P. Felt, T. D. A. Cockerell, Nathan Banks.

On motion, the Secretary was instructed to cast the ballot of the Society for the Officers nominated; which being done, they were declared duly elected.

On motion, it was voted to combine the evening program with that of the afternoon, so as to avoid a conflict in the evening with the biologists' smoker.

The Society then proceeded with its program, as follows:

The Role of Insects in Zoocecidial Evolution..........B. W. Wells
Attempts to Culture the Bacterial Symbionts of Blattidæ....... Marshall Hertig
Symposium: The Relations between Taxonomic Affinities and Food Habits of Insects, with Special Reference to Parasitism.
  A. Hymenoptera..........................Chas. T. Brues
  B. Diptera..................................J. M. Aldrich
  C. Mallophaga..........................Vernon Kellogg
A Recent Visit to Certain European Entomologists...L. O. Howard
The Life of the Bumblebee.........................T. H. Frison
Annual Address—Some Little-Emphasized Guideposts to Medical Entomology....................................W. A. Riley
The Evolution of the Subterranean Habit in Lepidopterous Larvæ L. B. Ripley

At 6 P. M. the meeting adjourned, the attendance at the last session having been about 135.

J. M. Aldrich,
Secretary.

REPORT OF COMMITTEE ON U. S. NATIONAL MUSEUM.*

Your Committee begs leave to report, as follows:

First: Activities during the year 1920.

In order that all might understand the importance of the Division of Insects of the U. S. National Museum and realize its needs to handle the vast volume of material submitted to it by entomologists for study and information, our report, submitted at the last annual meeting at St. Louis was printed in *Science*, as well as in the entomological journals, and reprints furnished to entomologists throughout the country for their use in advising on the subject. As a result the report was approved and assistance extended by the National Research Council, the Florida Entomological Society and the Indiana Academy of Science.

An itemized budget was not included in our report a year ago but the past year this matter has been carefully studied and a budget totaling $83,660.00 was decided upon as the amount needed at once. This amount is considered adequate to provide the needed curators, assistants and preparators, and will also furnish a suitable allowance for the purchase of needed supplies and equipment and permit a small amount for travel and exploration and in addition make it possible to inaugurate proper facilities for publication. This budget was presented to Dr. C. D. Walcott, Secretary of the Smithsonian Institution, October 1st, with the urgent request that he include the item in his budget for the National Museum. This could not be done as the budget had been sent to Congress previous to June but Doctor Walcott generously agreed to approve the item provided its inclusion by the house committee could be secured. Consequently the matter was taken up with Congressman Good, Chairman of the House Appropriations Committee, Doctor Walcott at the same time approving the item in a letter to Chairman Good. To this request we were advised that owing to the deficiency in the treasury and the many needs confronting Congress that additional appropriations could not be considered at this time. After careful consideration your committee believes it advisable to refrain from pushing the matter at the present session of Congress but to request insertion of the item in the Museum budget at the next session of Congress.

Second: Support needed. Your committee urges every member to be in readiness to secure the indorsement for National Museum support if needed. This refers to personal contact with your representatives in Congress or otherwise securing their support. We would urge especially that the scientific societies of the different states be advised of the needs and that their indorsement be secured and likewise that the approval and support be secured from such agricultural bodies as the state horticultural societies, agricultural societies, etc.

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* This report was adopted as a joint report with the American Association of Economic Entomologists.

We would urge that each one of you take every opportunity to educate the people relative to the importance and needs of the National Museum as a whole for we must build up every branch of the Museum if in future years we are to maintain a normal growth and expansion of the Division of Insects.

Third: Deposition of Types in the U. S. National Museum. Your committee feels that the National Museum should be the mecca for taxonomic entomological activity in the United States and would urge that entomologists make it a point to deposit types in the Museum. We would urge state institutions to likewise place the types, now in their collections, in the custody of the National Museum. This is already being done by certain institutions. Thus the type collections of the Connecticut Agricultural College, Colorado Agricultural College, Kansas Agricultural College, The Norton Collection at Yale, and others, will all probably be in the National Museum. We cannot urge too strongly that other institutions and individuals follow suit. In return the Division of Insects of the Museum promises to give the donors species new to their collections and help to build up their collection along the lines which will be most valuable to them. They further agree that any of the types there deposited are accepted on the condition that they can be borrowed by their institution at any time and for any reason, but they are not to go to any institution, or individual not connected with the institution presenting the material.

Respectfully submitted,

John J. Davis,
W. J. Holland,
V. L. Kellogg,
E. P. Felt,
Herbert Osborn,
Committee.

MEMBERS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA.

March 1, 1921.

The date of election as Honorary Fellow, Fellow or Member is shown by the date preceding the name.

Ch. signifies a charter member, December 28, 1906.

In the list of Fellows the date following the address shows the date of election as a Member.

In the list of Honorary Fellows the date of election as a Member is followed by the date of election as a Fellow.

HONORARY FELLOWS.

1914. Bethune, Charles James Stewart, Ontario Agricultural College, Guelph, Ontario, Canada. (Ch., 1906).

1914. Comstock, John Henry, Cornell University, Ithaca, N. Y. (Ch., 1906).

1907. Cresson, Ezra Townsend, Hedgleih, Swarthmore, Pa. (Ch., 1907).

1914. *Fernald, Charles Henry, Massachusetts Agricultural College, Amherst, Mass. (Ch., 1907).

1915. Forbes, Stephen Alfred, University of Illinois, Urbana, Ill. (Ch., 1907).

1914. Schwarz, Eugene Amandus, U. S. National Museum, Washington, D. C. (Ch., 1907).

FELLOWS.

1907. Aldrich, J. M., National Museum, Washington, D. C. (Ch).

1920. Alexander, C. P., 419 West Main St., Urbana, Ill. (1910).

1908. Ball, E. D., Iowa State College, Ames, Iowa. (Ch.).

1914. Banks, Nathan, Museum Comp. Zoology, Cambridge, Mass. (1908).

1913. Barnes, Wm., 152 East Prairie St., Decatur, Ill. (Ch.).

1908. Beutenmuller, Wm., Box 258, Highwood, Bergen County, New Jersey. (Ch.).

1920. Bezzi, Mario, Via Pio Quinto, 3, Torino, Italy. (1918).

1914. Bradley, J. Chester, Cornell University, Ithaca, N. Y. (Ch.).

1914. Britton, W. E., Experiment Station, New Haven, Conn. (Ch.).

1914. Brues, C. T., Bussey Institution, Forest Hills, Boston, Mass. (Ch.).

1907. Bruner, Lawrence, Lincoln, Nebr. (Ch.).

1917. Burgess, A. F., Melrose Highlands, Mass. (Ch.).

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*Died February 22, 1921.

1917. CAESAR, LAWSON, Ontario Agr. College, Guelph, Ontario, Canada. (1912).
1907. CALVERT, P. P., Zoology Dept., Univ. of Pennsylvania, Philadelphia, Pa. (Ch.).
1917. CHAMBERLIN, R. V., Museum Comp. Zool., Cambridge, Mass. (Ch.).
1908. COCKERELL, T. D. A., 908 Tenth St., Boulder, Colo. (1907).
1917. CRAMPTON, GUY C., 86 Pleasant St., Amherst, Mass. (1911).
1917. DAVIS, J. J., Purdue University, Lafayette, Ind. (Ch.).
1917. DAVIS, WM. T., 146 Stuyvesant Place, New Brighton, Staten Island, N. Y. (Ch.).
1917. DEAN, G. A., Kansas State Agricultural College, Manhattan, Kansas. (1913).
1907. EMERTON, J. H., 30 Ipswich St., Boston, Mass. (Ch.).
1907. FALL, H. C., Tyngsboro, Mass. (Ch.).
1908. FELT, E. P., State Entomologist, Albany, N. Y. (Ch.).
1914. FERNALD, H. T., Massachusetts Agr. College., Amherst, Mass. (Ch.).
1907. FOLSOM, J. W., University of Illinois, Urbana, Ill. (Ch.).
1920. FUNKHOUSER, W. D., Dept. of Zoology, University of Kentucky, Lexington, Ky. (1911).
1917. GIBSON, ARTHUR, Central Experiment Farms, Ottawa, Canada. (Ch.).
1907. GILLETTE, C. P., 620 Elizabeth St., Fort Collins, Colo. (Ch.).
1920. HEADLEE, T. J., Agricultural Experiment Station, New Brunswick, N. J. (Ch.).
1917. HEBARD, MORGAN, Chestnut Hill, Philadelphia, Pa. (Ch.).
1907. HENSHAW, SAMUEL, 28 Fayerweather St., Cambridge, Mass. (Ch.).
1914. HERRICK, GLENN W., College of Agriculture, Ithaca, N.Y. (Ch.).
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